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A new dictyopharid genus *Neonersia* gen. nov. from Cameroon (Hemiptera, Fulgoromorpha, Dictyopharidae, Orthopagini)

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Abstract

A new dictyopharid genus *Neonersia* Song & Deckert, **gen. nov.** is described here based on *Dictyophora* [sic] *fugax* Melichar, 1912 (previously also placed in the genus *Nersia* Stål, 1862) from Cameroon. The new genus is placed in the tribe Orthopagini. It may be easily distinguished from all other Orthopagini genera by carinate tegulae.

Keywords

Fulgoroidea, morphology, taxonomy, Afrotropical Region

Introduction

The dictyopharid planthopper tribe Orthopagini currently comprises 18 genera mainly distributed in the Old World tropics and subtropics, including the Afrotropical Region, India, Sri Lanka, southern China, Indochina, Malay Peninsula, the Greater Sunda Islands, the Philippines, the Moluccas, and northern Australia (Song et al. 2016d, 2018a, Bourgoin 2019). The Afrotropical genera, *Fernandea* Melichar, 1912, *Litocras* Emeljanov, 2008, *Macronaso* Synave, 1960, and *Nesolyncides* Fennah, 1958 were excluded from Orthopagini based on the study of the morphological phylogeny

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of the world Dictyopharidae (Song et al. 2018a). The monophyly of the tribe was tested and phylogenetic relationships among most genera were analysed by Song et al. (2014, 2016d, 2018a). Morphological characters support Orthopagini as a sister-group to Dictyopharini (Song et al. 2016b, d, 2018a). Fourteen genera are distributed in the Oriental region and three genera are found in the Afrotropical region, most of which have been revised (Liang and Song 2006, Song and Liang 2006a, b, 2007, 2011, 2012a, b, Song et al. 2012, 2014, 2016a, b, d, 2017, 2018b).

While sorting the type material of the dictyopharid species described by Melichar and deposited in the Museum für Naturkunde, Berlin, Germany (MFNB), we recognised that *Dictyophora* [sic] *fugax* Melichar, 1912 from Cameroon represents a new genus, which is described here as *Neonersia* Song & Deckert, gen. nov., illustrated and placed in Orthopagini.

Material and methods

The post-abdomen of the specimen used for dissection was cleared in 10% KOH at room temperature for ca. 6–12 hours, rinsed and examined in distilled water and then transferred to 10% glycerol and enclosed in a microvial to be preserved with the specimen. Observations, measurements and photography were conducted under a SOPTOP SZX12 optical stereomicroscope with a Canon EOS 7D digital camera at the Jiangsu Key Laboratory of Biofunctional Molecules, Jiangsu Second Normal University, China. Some final images were compiled from multiple photographs using Helicon Focus 6 image stacking software and improved with the Adobe Photoshop CC.

The morphological terminology and measurements used in this study follow Song et al. (2016a, b, 2018a) for most characters and Bourgoin et al. (2015) for forewing.

Taxonomy

Family Dictyopharidae Spinola, 1839

Genus *Neonersia* Song & Deckert, gen. nov.

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Type species. *Dictyophora* [sic] *fugax* Melichar, 1912; by present designation.

Diagnosis. The new genus may be distinguished from other genera in the Orthopagini by the following combination of characters: lateral carinae of vertex, upper lateral carinae of pronotum, carinae of tegulae and costal margins of forewings thickened and pigmented; tegulae broadly carinate; vertex broad, nearly twice as wide at base as transverse diameter of eyes, posterior plane horizontal with pronotum, median carina complete, but only distinct and sharp between eyes; pronotum with intermediate carinae nearly complete; mesonotum with lateral carinae incurving and converging anteriad,

reaching and connecting median carina; forewings with numerous transverse veins in apical half, costal margin distinctly expanded, MP branching to dozens of accessory veins in apical half, Pcu and A_1 veins fused into a short Pcu+A1 vein, pterostigmal area elongate; fore femora not flattened and dilated, without spine, hind tibiae with eight apical teeth, hind tarsomeres I each with nine apical teeth and tarsomeres II each with eight apical teeth; endosomal processes short and straight; inflated membranous paired lobes of phallobase with numerous small superficial spines on apex.

Description. Adult. General colour of body pale green to green, lateral carinae of vertex, upper lateral carinae of pronotum, carinae of tegulae stramineous (Fig. 1).

Head moderately elongate, broad and large. Vertex (Fig. 2A) broad, nearly twice as wide at base as transverse diameter of eyes; posterior plane horizontal with pronotum; lateral carinae pigmented, thickened, distinctly ridged and subparallel at base, slightly constricted in front of eyes, then gradually convergent anteriad; anterior margins broadly angularly convex; posterior margin ridged and broadly angularly concave; median carina complete, but only distinct and sharp between eyes. Frons (Fig. 2C) with lateral carinae ridged, nearly parallel, distinctly expanded outward below antennae; intermediate carinae widest apart at one quarter from base, slightly converging posteriad and approaching frontoclypeal suture; median carina distinct and complete. Postclypeus and anteclypeus (Fig. 2C) elongate, convex medially, median carina distinct and complete. Rostrum moderately long, reaching middle of hind femora; basal segment long, more than 1.5 times as long as distal one. Compound eyes (Fig. 2B) large and globose. Ocelli relatively large, reddish. Antennae (Fig. 2C) with very small scape; pedicel large and subglobular, with more than 50 distinct sensory plaque organs distributed over entire surface; flagellum long, setuliform.

Pronotum (Fig. 2A) distinctly shorter than mesonotum at midline, anterior central margin arcuately convex; posterior margin angularly concave, forming angle of about 90°; lateral marginal areas straight and sloping with two longitudinal carinae on each side between eyes and tegulae, upper lateral carina (Fig. 2B) pigmented and thickened; intermediate carinae present and nearly complete; median carina ridged and high, with a big lateral pit on each side. Mesonotum (Fig. 2A) distinctly arched and clearly tricarinate on disc, lateral carinae incurving and converging anteriad, reaching and connecting the end of median carina. Tegulae broadly carinate, each with carina of same colour as upper lateral carina of pronotum. Forewings (Fig. 2D) hyaline, venation with numerous transverse veins in apical half; costal margin distinctly expanded into a narrow, sclerotized costal area, without transverse veins; MP bifurcating MP_{1+2} and MP_{3+4} at basal 2/5 and beyond CuA, then branching to dozens of accessory veins in apical half; number of apical cells between RP and CuA equal to 20; Pcu and A_1 veins fused into a short Pcu+A1 vein at apical 1/4 of clavus; pterostigmal area elongate, with 5–7 cells. Legs slender and moderately elongate; fore and middle femora long, hind tibiae more than twice as long as hind femora; fore femora not flattened and dilated, without spine; fore and middle tarsomeres I and II each with two distinct acutellae; hind tibiae each with six lateral spines and eight apical teeth; hind tarsomeres I each with nine apical teeth and tarsomeres II each with eight apical teeth.

Figure 1. Habitus of *Neonersia fugax* (Melichar). **A** Dorsal view **B** lateral view **C** ventral view. Scale bars: 2 mm.

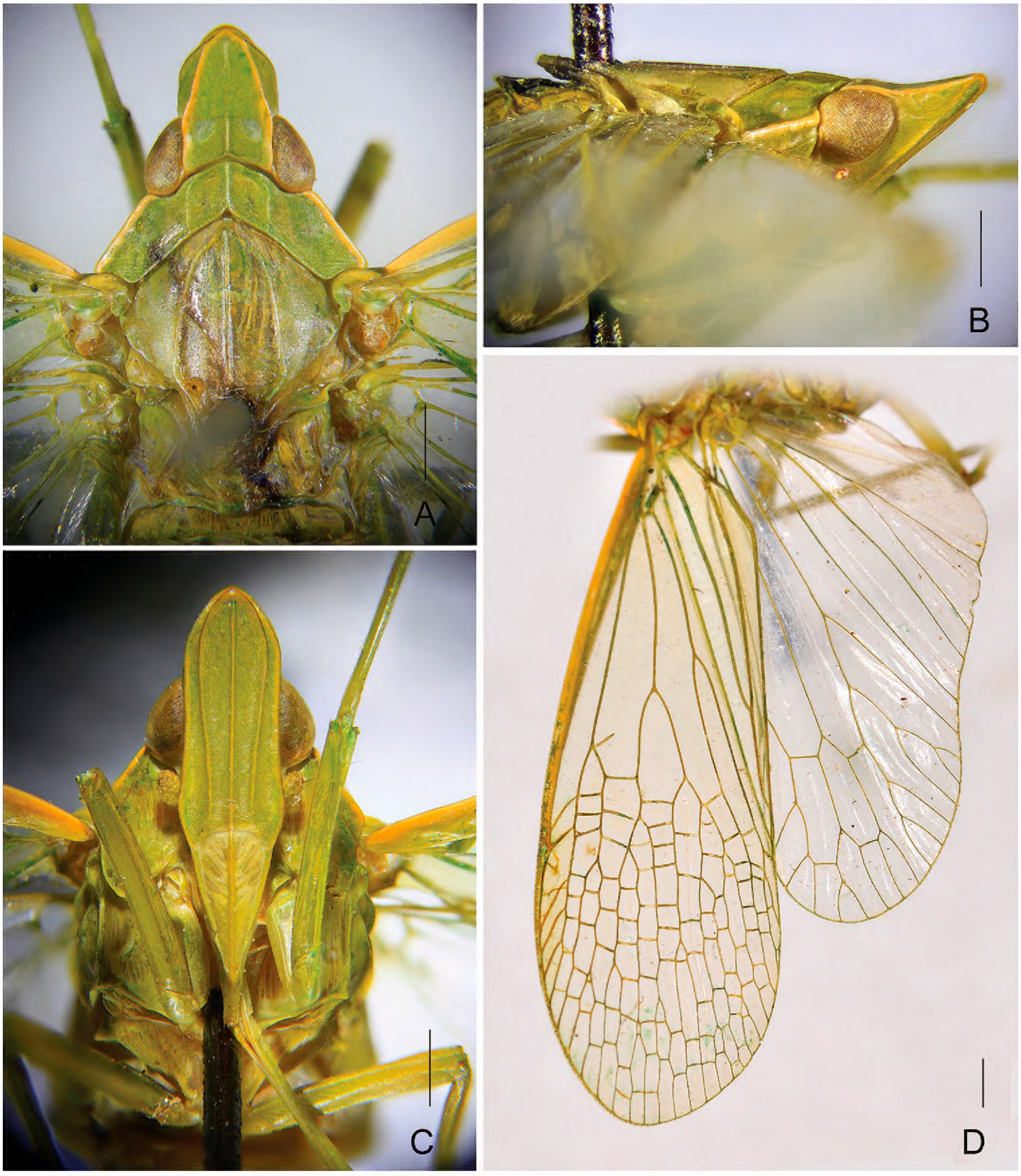

Figure 2. *Neonersia fugax* (Melichar). **A** Head, pronotum and mesonotum, dorsal view **B** head and pronotum, lateral view **C** head and pronotum, ventral view **D** forewing and hindwing. Scale bars: 1 mm.

Male genitalia. Pygofer (Figs 3A–C, 4A–C) large and broad, in lateral view (Figs 3B, 4B), wider ventrally than dorsally, posterior margin slightly convex, without process; in dorsal view (Figs 3B, 4B), dorsal margin slightly excavated to accommodate segment X. Gonostyles (Figs 3B–D, 4B–D) symmetrical, with narrow base, expanded toward apex, broadest at apical fourth; dorsal margin (Fig. 4D) strongly inflated, with a claw-like process directed anteriad, outer dorsal edge with a hook-like process near

Figure 3. *Neonersia fugax* (Melichar). **A** Male segment X and pygofer (not dissected), dorsal view **B** male pygofer, gonostyles, and segment X (not dissected), lateral view **C** male pygofer and gonostyles (not dissected), ventral view **D** gonostyle. Scale bars: 0.5 mm.

middle directed ventrad. Aedeagus (Fig. 5A–E) with a pair of endosomal processes extended from phallobase which are short, straight and sclerotised; phallobase sclerotised and pigmented basally, membranous and inflated apically, with paired lobes covered with numerous small superficial spines. Segment X (Figs 3A,B, 4A,B) large, in dorsal view (Figs 3A, 4A), median portion broadly longitudinally convex from base to apex, with apex deeply excavated to accommodate anal style; anal style elongate.

Female unknown.

Figure 4. *Neonersia fugax* (Melichar). **A** Male segment X and pygofer, dorsal view **B** male pygofer, gonostyles, and segment X, lateral view **C** male pygofer and gonostyles, ventral view **D** male pygofer, gonostyles, and segment X, caudal view. Scale bars: 0.5 mm.

Etymology. The generic epithet is a combination of the prefix "neo" plus "*Nersia*", gender: feminine. The type species, *Dictyophora* [sic] *fugax*, along with *Dictyophora* [sic] *serena* Melichar, 1912, *Dictyophora* [sic] *orbata* Melichar, 1912 and *Dictyophora* [sic] *paupera* Melichar, 1912, were also considered as belonging to the Neotropical genus *Nersia* Stål, 1862 in the same literature by Melichar (1912). The latter species

were moved to *Afronersia* Fennah, 1958 (Fennah 1958, Emeljanov 2011) or *Neodictya* Synave, 1965 (Synave 1965), but *D. fugax* stayed in the *Nersia*. The name of the new genus means this genus is similar to *Nersia*.

Diversity and distribution. As far as it is known, *Neonersia* is monotypic and restricted to Cameroon.

Remarks. *Neonersia* gen. nov. can be distinguished from all other genera of Orthopagini by the carinate tegulae. The genus is externally similar to *Phaenodictyon* Fennah, 1958, but may be separated from the latter by the following characters: lateral carinae of vertex, upper lateral carinae of pronotum, carinae of tegulae and costal margins of forewings thickened and pigmented; the tegulae stoutly carinate; the forewings with more transverse veins on apical half; the fore femora without spine; and the pygofer without posterior process.

Neonersia fugax (Melichar, 1912), comb. nov.

Dictyophora [sic] *fugax* Melichar, 1912: 137.
Nersia fugax (Melichar): Melichar 1912: 132; Metcalf 1946: 56.

Type material examined. Holotype ♂ of *Dictyophora* [sic] *fugax* Melichar, 1912 – (1) N. Kamerun, Joh. Albrechtshöhe, IV.96, L. Conradt S.; (2) blue square label; (3) fugax n. sp. [handwriting]; (4) Holotype [newly added red label] (MFNB).

Description. Body length excluding forewings 12.7 mm; head length (from apex of head to base of eyes) 2.2 mm; head width (including eyes) 2.3 mm; forewing length 14.0 mm.

Coloration. General colour (Fig. 1) of body pale green to green. Head (Fig. 2A–C) excluding eyes, pronotum and mesonotum pale green to green, lateral carinae of vertex, upper lateral carinae of pronotum, carinae of tegulae stramineous. Compound eyes (Fig. 2B) pale brown, ocelli purplish-red. Forewings (Fig. 2D) with membrane hyaline, veins greenish yellow, some transverse veins green, costal area stramineous, pterostigmal area more or less greenish yellow. Thorax pale green ventrally. Legs yellowish green, tarsi piceous. Abdomen virescent or greenish ochraceous.

Structure. Head (Fig. 2A–C) large and broad. Vertex (Fig. 2A) longer than wide, with ratio of length at midline to width between eyes 1.5:1. Frons with ratio of length at midline to maximum width 2.4:1; median and intermediate carinae absent (Fig. 2C). Forewings (Fig. 2D) hyaline, ratio of length to width about 2.9:1. Legs slender and moderately elongate; fore femora not flattened and dilated, without spine; hind tibiae each with six lateral spines and eight apical teeth; hind tarsomeres I each with nine apical teeth and tarsomeres II with eight apical teeth.

Male genitalia. Pygofer, in lateral view (Fig. 4B), with posterior margin slightly convex; in ventral view (Fig. 4C) longer than in dorsal view (Fig. 4A) with ratio of ventral to dorsal width about 1.7:1. Gonostyles (Fig. 3D) elongate, relatively narrow and concave in basal half, dorsal margin strongly inflated, dorsal apical process acute, directed anteriad. Aedea-

Figure 5. *Neonersia fugax* (Melichar). **A** Aedeagus, dorsal view **B** aedeagus, lateral view **C** aedeagus, ventral view **D** aedeagus, caudal view **E** endosomal processes. Scale bars: 0.5 mm.

gus (Fig. 5A–E) large and strongly inflated when it was cleared and erected in KOH solution, endosomal processes (Fig. 5E) sclerotised, straight and short, just visible from phallotheca, not surpassing lobes of phallobase, apex obtuse. Phallobase with a large ventral lobe, covered with numerous minute superficial spines, basal portion inflated and directed

ventrad (Fig. 5B,D), apical portion forming two pairs of lobes: one pair gradually convergent and tapering posteriad (Fig. 5A–C), another pair more or less rounded, directed dorsad (Fig. 5A, B); and a pair of thumb-like dorsal lobes from dorsal apex, directed dorsad (Fig. 5A, B, D). Segment X, in dorsal view (Fig. 5A), long oval and broadest medially, with ratio of length to maximum width 1.5:1, median portion broadly longitudinally convex from base to apex; in lateral view (Fig. 5B), short and robust, with ventral margin gradually widening from base to apex; anal style large, beyond apical ventral margin of segment X.

Distribution. So far only known from Cameroon.

Remarks. Melichar (1912) described *D. fugax* based on male material from northern Cameroon, but did not state the number of the specimens he used for the description. In the Melichar's collection in MFNB, there is a single male of *D. fugax* which is not pinned with a type label. It fully confirms the original description including the associated locality data. Based on the Articles 72.4.1.1 and 73.1.2 of ICZN (1999), this male specimen is considered the holotype fixed by monotypy.

Discussion

Neonersia Song & Deckert, gen. nov. is placed in the tribe Orthopagini based on the following combination of characters: paranotal lobes of pronotum without carina; lateral carinae of mesonotum incurving and converging anteriad; forewings with one folding line between MP_3 and MP_4, ScP+R and MP originating from basal cell without common stem or with a very short common stem; fore and middle tarsomeres I and II each with two acutellae; and aedeagus with apical lobes of phallobase spineless or with very short small spines.

Within Orthopagini, *Neonersia* gen. nov. is the only taxon with a carina on the tegulae. The carinate tegulae can also be used to distinguish the genus from most Afrotropical Dictyopharini (Fennah 1958, Emeljanov 2008, 2011, Song et al. 2018a), except for *Afronersia* (Dictyopharini), which is very similar to *Neonersia* gen. nov. *Afronersia* can be differentiated from the new genus by the paranotal lobes of the pronotum with long carina; the lateral carinae of the mesonotum nearly straight and parallel; and the apical lobes of phallobase with long and slender spines. Also some genera of the Neotropical tribe Nersiini, including e.g. *Nersia* and *Megadictya* Melichar, 1912, share the carinate tegulae with *Neonersia* gen. nov. They may be distinguished from *Neonersia* gen. nov. by a common stem of ScP+R and MP on the forewings.

Emeljanov (2011) suggested that the carinate tegulae originated most likely only once in the course of the evolution of the African Dictyopharini and that all African species sharing this character should be placed in *Afronersia*. He considered the feature to be more stable than structural characters of the genitalia, wing venation, and head shape (Emeljanov 2011). However, Synave (1965) believed the same character to be rather weak at the generic level because the carina on the tegulae can be too obscure to be observed clearly in some *Afronersia* species. Based on the current phylogenetic hypothesis, the carinate tegulae sporadically occur in three different tribes, thus showing a high degree of homoplasy (Song et al. 2018a).

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